MULTIPLE ROOT IMPLANT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of pending U.S. patent application Ser. No. 11/847,476, filed Aug. 30, 2007, which is incorporated herein by reference in its entirety for all purposes.

FIELD OF INVENTION

The present invention relates to bone implant prosthetic devices and, in particular, to a dental prosthetic device with a shape for resisting torsional force applied to the device.

BACKGROUND

A dental implant or fixture is surgically implanted into a patient's upper or lower jaw to directly or indirectly anchor and support prosthetic devices, such as an artificial tooth. The implants are usually placed at one or more edentulous sites in a patient's dentition at which the patient's original teeth have been lost or damaged in order to restore the patient's chewing function. In many cases, the implant anchors a dental abutment, which in turn provides an interface between the implant and a dental restoration. The restoration is typically a porcelain crown fashioned according to known methods.

One form of a prosthetic device is a unitary or one-piece implant device with a bone-engaging implant portion and an abutment portion integral with the implant portion. Another form of a prosthetic device is a multiple piece device where the abutment is assembled onto the implant. A desire still exists, however, to improve the osseointegration characteristics of such dental devices.

One problem with one-piece dental devices is that the titanium and other materials used for such devices often are an unattractive color. Thus, when the abutment portion of the device below a prosthetic tooth but above the gum or gingival tissue is visible and does not have the color of natural teeth, the dental device provides a non-esthetically pleasing appearance in a person's mouth. Other known dental devices that have the color of natural teeth typically provide inadequate strength resulting in relatively frequent replacement or repair of the device.

Whether or not the dental implant device is a one-piece or part of a multiple piece device where the abutment is assembled onto the implant, the implant is usually either threaded or press-fit into a bore which is drilled into the patient's mandible or maxilla at the edentulous site. The press-fit implant is inserted by applying a force to the coronal end of the implant in an insertion direction. For a threaded implant, self-tapping threads may be provided for initial stability of the implant immediately after surgery. Before biologic integration has time to take place, the threads resist tension, twisting, or bending loads applied to the implant. Additionally, patients prefer to leave the initial surgery with some type of restoration and it has further been shown that the healing of the soft and hard bone tissue is improved if the implant is loaded after surgery.

The surgical procedure for inserting the threaded implants, however, can be complicated and requires that the threaded implants be turned into place, which further requires the use of special tools and inserts. The torque needed to place the implant into the jaw can be high and may require tapping of the bore on the jaw, which adds yet another step to the surgical procedure where tapping typically is not desired. Also with

threaded implants, it is often difficult to achieve optimal esthetics where, for example, a prosthetic is held at an ideal orientation by the implant because the geometry of the thread establishes a fixed relationship between the final vertical and rotational orientation of the implant such that a vertical adjustment requires a rotational adjustment and vice-versa.

Alternatively, a press fit implant has a much simpler surgical procedure. For a press fit implant, the implant is inserted by applying a force to the coronal end of the implant in an insertion direction. Unlike the self-tapping, threaded dental implants, however, the current press fit designs provide insufficient frictional contact with the bore to adequately restrict the rotation of the implant within the bore or prevent the implant from pulling out of the bore that can be caused by mastication forces. Thus, the current press fit designs provide very little initial stability and are not well suited for early and immediate loading procedures that are currently used in dentistry. A desire still exists, therefore, to provide press fit implants with greater resistance to mastication forces.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a cross-sectional view of a first embodiment of a one-piece dental implant prosthetic device in accordance with the present invention;

FIG. **2** is an enlarged fragmentary view of a porous tantalum portion for any of the embodiments herein and in accordance with the present invention;

FIG. **3** is an enlarged sectional view of a porous tantalum portion and a filler material for a number of embodiments herein and in accordance with the present invention;

FIG. **4** is a cross-sectional view of a second embodiment of a one-piece dental implant prosthetic device in accordance with the present invention;

FIG. **5** is a cross-sectional view of a third embodiment of a one-piece dental implant prosthetic device in accordance with the present invention;

FIG. **6** is a side elevational view of an instrument used to aid in press-fitting an implant into a jaw bone in accordance with the present invention;

FIG. **7** is a side elevational view of an alternative implant configured for press-fitting in accordance with the present invention;

FIG. **8** is a top view of the alternative implant of FIG. **7**;

FIG. **9** is a side elevational view of another implant configured for press-fitting in accordance with the present invention;

FIG. **10** is a top view of the implant of FIG. **9**;

FIG. **11** is a graphical representation of the overall elastic modulus for a porous metal/composite material structure as a function of an elastic modulus of a filler material for the structure;

FIG. **12** is a schematic diagram showing the boundary conditions used for computing Young's modulus for the porous metal/composite material structure shown graphically in FIG. **11**;

FIG. **13** is a side elevational view of another implant configured for press-fitting in accordance with the present invention;

FIG. **14** is a top view of the implant in FIG. **13**;

FIG. **15** a side elevational view of another implant configured for press-fitting in accordance with the present invention;

FIG. **16** is a side, cross-sectional view of a bore holding the press-fit implant of FIG. **15** in accordance with the present invention;